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Weed Management and Soybean Yields as Influenced by Row Width and Post-Emergent Herbicide Application Timing

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Abstract

Irrigated soybeans were grown in 2018 and 2019 at the Kansas River Valley Experiment Field near Rossville, KS. Soybeans were planted in 30-inch or 15-inch rows and a standard pre-emergent herbicide was applied. Planting dates were May 11 and June 4 in 2018 and 2019, respectively. The post-emergent herbicide was applied at approximately 21 or 35 days following soybean planting (DAP). Weed control and crop injury were visually evaluated approximately every seven days following herbicide application. Yields, moisture, and test weights were calculated from the center two rows in 30-inch plots and four rows in 15-inch plots after combine harvest. Predominant weeds present were Palmer amaranth, giant foxtail, ivyleaf morningglory, and honeyvine milkweed. Soybean yields from plots without post-emergent herbicide applied were reduced 6–17% vs. those that were treated. In the 27-day longer growing season of 2018, yield of soybeans planted in 15-inch rows trended slightly, though not significantly, higher than those planted in 30-inch rows.

Keywords

soybeans, weed management, row width, herbicide timing, irrigation

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Summary

Irrigated soybeans were grown in 2018 and 2019 at the Kansas River Valley Experiment Field near Rossville, KS. Soybeans were planted in 30-inch or 15-inch rows and a standard pre-emergent herbicide was applied. Planting dates were May 11 and June 4 in 2018 and 2019, respectively. The post-emergent herbicide was applied at approximately 21 or 35 days following soybean planting (DAP). Weed control and crop injury were visually evaluated approximately every seven days following herbicide application. Yields, moisture, and test weights were calculated from the center two rows in 30-inch plots and four rows in 15-inch plots after combine harvest. Predominant weeds present were Palmer amaranth, giant foxtail, ivyleaf morningglory, and honeyvine milkweed. Soybean yields from plots without post-emergent herbicide applied were reduced 6–17% vs. those that were treated. In the 27-day longer growing season of 2018, yield of soybeans planted in 15-inch rows trended slightly, though not significantly, higher than those planted in 30-inch rows.

Introduction

Increasing incidences of herbicide resistant weeds in soybean production have led to more integrated weed management programs. The incorporation of pre-emergence herbicides and narrowing soybean row width are two fairly simple and effective practices to help boost soybean yields and improve weed suppression. Palmer amaranth has become an extremely important, and difficult, weed to control with herbicides alone. In Kansas, resistance of Palmer amaranth to five different herbicide groups has been documented and is suspected in two more. Our goal was to reduce weed competition to soybeans with an integrated management plan resulting in less competition, greater yields and greater profits for growers.

Procedures

The studies were established in 2018 and 2019 at the Kansas River Valley Experiment Field Rossville Unit just east of Rossville, KS, on a Eudora sandy/silt loam soil. All plots were planted with a Kinze 7000 split-row planter. For 30-inch rows, every other planter unit was disabled. The treatments were arranged in a randomized complete block design with four replications. Individual plots were 10 feet by 35 feet. Cultural practices are listed in Table 1. The soybean cultivar was changed for the 2019 experiment to one with dicamba tolerance due to anticipated herbicide drift issues from other studies and

neighboring fields. Post-emergent herbicide treatments were applied as described in Table 2. Weed control and crop injury were recorded both years. Weed control was excellent and very little, if any, crop phytotoxicity from the post-emergent treatments was noted (data not shown). At harvest the center two rows from the 30-inch plots and the center four 15-inch rows were machine harvested with a John Deere 3300 combine with a 5-foot header. Plot weight, moisture and test weight for each plot was taken at harvest. Soybean yields were adjusted to row width and 13% moisture.

Results

2018

The yields in 2018 were excellent (Table 3) as the result of a full 160-day growing season and excellent precipitation nearly all season long to supplement the irrigation. The pre-emergence herbicide program was applied to all plots, including the untreated checks, since this study was focused on a post-emergent program. The pre-emergence received adequate rainfall to be activated and did a good job early. The area of the study was in a prime Palmer amaranth and giant foxtail area of the field. Emergence was a little slowed by limited rainfall after planting, but the crop did emerge and establish fairly uniformly. The first post-emergent application (Table 2) was made June 5 (26 DAP) when soybeans had reached V3, just as Palmer amaranth (2-leaf), ivyleaf morningglory (cotyledons), and giant foxtail (1-2 leaf) were breaking through the pre-emergence herbicides. Excellent control of the broadleaves was obtained in all treatments, but giant foxtail was not affected in treatments that did not contain Roundup PowerMAX in the mix. The 35 DAP post-emergent treatments were applied June 18. Soybeans were at five to six leaf and moving to R1. At that point, some of the Palmer amaranth was past the labeled maximum height of 4–6 inches for adequate control and morning-glory was spreading out up to eight inches. Control was still fairly good, but some weeds did escape and were a challenge the rest of the growing season. Adequate rainfall and supplemental irrigation carried the crop successfully to harvest. Soybeans were harvested October 18. Yield results (Table 3) for even the very weedy Untreated Check treatments were still 63.5 bu/a, but the weed seedbank increased tremendously in those areas. Fifteen-inch row soybeans with good weed control tended to be top yielders, but the top 30-inch row yields were not significantly less. Another, not statistically significant trend, was that the straight Cobra treatments on 26 DAP soybeans at either row spacing and led us to consider adjustments for the next year.

2019

The spring planting season was entirely different in 2019. Soybeans were not planted until June 4 because of frequent and excessive rainfall the entire month of May. In addition, the cultivar used was changed to one with dicamba tolerance for insurance against ambient drift into the plots, and the pre-emergence treatment was adjusted to more closely fit practices of local growers (Table 1). Again, the pre-emergence herbicide mixture was applied to all plots. Soybeans germinated and emerged rapidly and uniformly. Palmer amaranth pressure was heavy, but not as intense as in 2018, but the giant foxtail was off to a strong start as the result of plenty of moisture and warm soil. The first post-emergent treatments were early (only 17 DAP) because of the rapid growth of the weeds and the soybeans, which were V3-V4. Weed kill from this application was good, but there were already Palmer amaranth weeds that were

burned back but survived. Soybeans in 15-inch rows did out-compete the stunted weeds and suppressed them fairly well the rest of the season. The soybeans in 15-inch rows had closed the canopy less than 30 days after that first application. More weeds survived the first post-emergent in 30-inch row soybeans and were able to compete and produce more seed than desired (personal observation). The application at 35 DAP did an adequate job of controlling weeds, but the soybean canopy was closing rapidly and sheltering many of the larger weeds in the canopy from getting complete coverage. Soybeans were harvested October 15. The entire 2019 growing season from planting to harvest was 133 days, fully 27 days shorter than the 2018 growing season. Yields were still good (Table 3), and once again the numerically highest yields were in the 15-inch rows. However, in 2019, it was the two latest treatments that trended to the top. Interestingly, neither was statistically significantly greater than the untreated checks of either row spacing.

Future Research

This study will continue in 2020 with two planting dates vs. one. In addition, canopy closure will also be monitored to aid in developing a sound dataset that growers, advisors, and industry can use to make sound decisions.

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Table 1. Practice summary for a soybean weed management study

	2018	2019
Cultivar	Bayer LL CZ3481LL	Asgrow 39X7 with ILeVO
Seeding rate per acre		
15-inch rows	155,000	160,000
30-inch rows	140,000	140,000
Pre-emergence herbicide	1 quart/a Durango + 3.4 oz Fierce	6 oz Authority Maxx + 1.5 pt Dual II Magnum + 24 oz Roundup WeatherMAX
Planting date	May 11	June 4
21 DAP treatment	June 5	June 21
35 DAP treatment	June 18	July 8
Harvested	October 18	October 15

DAP = days after planting.

Table 2. Treatments for post-emergent weed management study in soybeans in 2018–2019

Row width	Herbicide(s)	Rate(s)	Timing
Inches		Product/a	Days after planting
15	Untreated (UTC)	---	---
15	Cobra	11 oz.	21
15	Cobra + Roundup PowerMAX	11 oz. + 39 oz.	21
15	Cobra	11 oz.	35
15	Cobra + Roundup PowerMAX	11 oz. + 39 oz.	35
30	Untreated (UTC)	---	---
30	Cobra	11 oz.	21
30	Cobra + Roundup PowerMAX	11 oz. + 39 oz.	21
30	Cobra	11 oz.	35
30	Cobra + Roundup PowerMAX	11 oz. + 39 oz.	35

Table 3. Soybean yields as affected by a post-emergent weed management program 2018–2019

Row width	Herbicide	Rate	Days after planting	Yield	
				2018	2019
Inches		Product/a		---------- bu/a ----------	
15	Untreated (UTC)	---	---	62 d†	68 ab
15	Cobra	11 oz.	21	76 bc	60 b
15	Cobra + Roundup PowerMAX	11 oz. + 39 oz.	21	81 ab	67 ab
15	Cobra	11 oz.	35	84 ab	75 a
15	Cobra + Roundup PowerMAX	11 oz. + 39 oz.	35	89 a	75 a
30	Untreated (UTC)	---	---	66 cd	65 ab
30	Cobra	11 oz.	21	73 bcd	68 ab
30	Cobra + Roundup PowerMAX	11 oz. + 39 oz.	21	77 abc	68 ab
30	Cobra	11 oz.	35	87 abc	64 b
30	Cobra + Roundup PowerMAX	11 oz. + 39 oz.	35	80 ab	70 ab

† Means within a year followed by the same letter are not significantly different at $\alpha = 0.10$.